

- (b) heating a mixture of said matrix solder with the components of said intermetallic component at a temperature greater than the highest melting temperature of any of the individual components of said mixture so as to form a non-solid mixture; and
- (c) cooling said non-solid mixture at a rate of at least about 100°C/second.
27. (new) A method of Claim 26, wherein said intermetallic component comprises a transition metal.
28. (new) A method of Claim 27, wherein said intermetallic component comprises a first row transition metal.
29. (new) A method of Claim 28, wherein said intermetallic component comprises a metal selected from the group consisting of nickel, iron, copper, and mixtures thereof.
30. (new) A method of Claim 29, wherein said intermetallic component comprises Cu_6Sn_5 .
31. (new) A method of Claim 29, wherein said intermetallic component comprises Ni_3Sn_4 .
32. (new) A method of Claim 29, wherein said intermetallic component comprises FeSn_2 .
33. (new) A method of Claim 27, wherein said intermetallic component additionally comprises a metal which is a component of said matrix solder.
34. (new) A method of Claim 26, wherein said matrix solder is a lead-free eutectic or near-eutectic solder.

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35. (new) A method of Claim 34, wherein said matrix solder is a binary or ternary solder.
36. (new) A method of Claim 35, wherein said matrix solder is 96.5 Sn/3.5 Ag.
37. (new) A method of Claim 26, wherein said intermetallic component comprises about 20% by volume of said composite solder.
38. (new) A method of Claim 26, wherein said intermetallic component comprises particles less than about 10 microns in size.
39. (new) A method of Claim 38, wherein said particles are less than about 5 microns in size.
40. (new) A method of Claim 39, wherein said particles are less than about 2 microns in size.
41. (new) A method of Claim 26, wherein said cooling step comprises cooling by spat quenching, spray atomization, or by continuous casting into a solid form.
42. (new) A method for producing an *in-situ* composite solder having an intermetallic component, comprising the steps of:
- (a) providing a matrix solder comprising two or more metals;
 - (b) heating a mixture of said matrix solder with the components of said intermetallic component at a temperature greater than the highest melting temperature of any of the individual components of said mixture so as to form a non-solid mixture;
 - (c) cooling said non-solid mixture to form a solid mixture;
 - (d) heating said solid mixture formed in step (c) to a temperature greater than the melting point of the components of said intermetallic component; and

(e) cooling the heated mixture of step (d) at a rate of at least about 100°C/second.

43. (new) A method of Claim 42, wherein said intermetallic component comprises a first row transition metal.

44. (new) A method of Claim 43, wherein said intermetallic component comprises a metal selected from the group consisting of nickel, iron, copper, and mixtures thereof.

45. (new) A method of Claim 44, wherein said intermetallic component comprises a compound selected from the group consisting of Cu_6Sn_5 , Ni_3Sn_4 , FeSn_2 , and mixtures thereof.

46. (new) A method of Claim 43, wherein said intermetallic component additionally comprises a metal which is a component of said matrix solder.

47. (new) A method of Claim 42, wherein said matrix solder is a lead-free eutectic or near-eutectic binary or ternary solder.

48. (new) A method of Claim 47, wherein said matrix solder is 96.5 Sn/3.5 Ag.

49. (new) A method of Claim 42, wherein said intermetallic component comprises about 20% by volume of said composite solder.

50. (new) A method of Claim 42, wherein said particles are less than about 5 microns in size.

51. (new) A method of Claim 50, wherein said particles are less than about 2 microns in size.

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52. (new) A method of Claim 42, wherein said cooling step comprises cooling by spray quenching; spray atomization, or by continuous casting into a solid form.

53. (new) A method for producing an *in-situ* composite solder having an intermetallic component, comprising the steps of:

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- (a) providing a binary or ternary matrix eutectic or near eutectic solder;
 - (b) heating a mixture of said matrix solder with the components of a intermetallic component comprising a first row transition metal, at a temperature greater than the highest melting temperature of any of the individual components of said mixture so as to form a non-solid mixture; and
 - (c) cooling said non-solid mixture at a rate of at least about 100°C/second to form said composite solder wherein said intermetallic component has a particle size less than about 10 microns.

54. (new) A method of Claim 53, wherein said particle size is less than 5 microns.

55. (new) A method of Claim 54, wherein said particle size is less than 2 microns.

56. (new) A method of Claim 53, wherein said intermetallic component comprises (a) a metal which is a component of said matrix solder, and (b) a metal selected from the group consisting of nickel, iron, copper, and mixtures thereof.

57. (new) A method of Claim 56, wherein said intermetallic component comprises a compound selected from the group consisting of Cu_6Sn_5 , Ni_3Sn_4 , FeSn_2 , and mixtures thereof.

58. (new) A method of Claim 57, wherein said matrix solder is 96.5 Sn/3.5 Ag.

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